

**JUNPERUS VIRGINIANA IN THE SERRANIAS DEL BURRO
MOUNTAINS, COAHUILA, MEXICO:
A PLEISTOCENE RELICT**

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ABSTRACT

The nrDNA sequence of the smooth leaf margined juniper of the Serranias del Burro was compared with *J. virginiana*, *J. scopulorum* and *J. blancoi*. nrDNA from S. del Burro was most similar to *J. virginiana* and then to the *J. blancoi*/*scopulorum* juniper from Colonia Pacheco. The Serranias del Burro population differs by 3 SNPs in its nrDNA from typical *J. virginiana* (central Texas) and appears to be a Pleistocene relict. *Phytologia* 93(2):168-173 (August 1, 2011).

KEY WORDS: *Juniperus virginiana*, *J. scopulorum*, *J. blancoi*, geographic variation, nrDNA, SNPs, Pleistocene refugia, Serranias del Burro.

In a related study, Adams (2011) reported putative *Juniperus scopulorum* Sarg. from Colonia Pacheco, Mexico was very divergent from typical *J. scopulorum* in the Rocky Mountains. Analysis of nrDNA SNPs revealed that the Colonia Pacheco juniper was more similar to *J. blancoi* than *J. scopulorum*. However, the leaf essential oil was a little more similar to *J. scopulorum* than to *J. blancoi* (Adams, 2011). Adams (2011) concluded that the Colonia Pacheco juniper was the northern-most population of *J. blancoi*, but not typical due to hybridization with *J. scopulorum* in the Pleistocene.

A similar Mexico population of putative *J. scopulorum* exists in the Serranias del Burro Mountains, Coahuila. The author (with David Riskind) collected samples of putative *J. scopulorum* / *J. virginiana* at 1550m in 1977. Analysis of the leaf essential oils (Adams, 1983) indicated (Fig. 1) the S. del Burro population was most

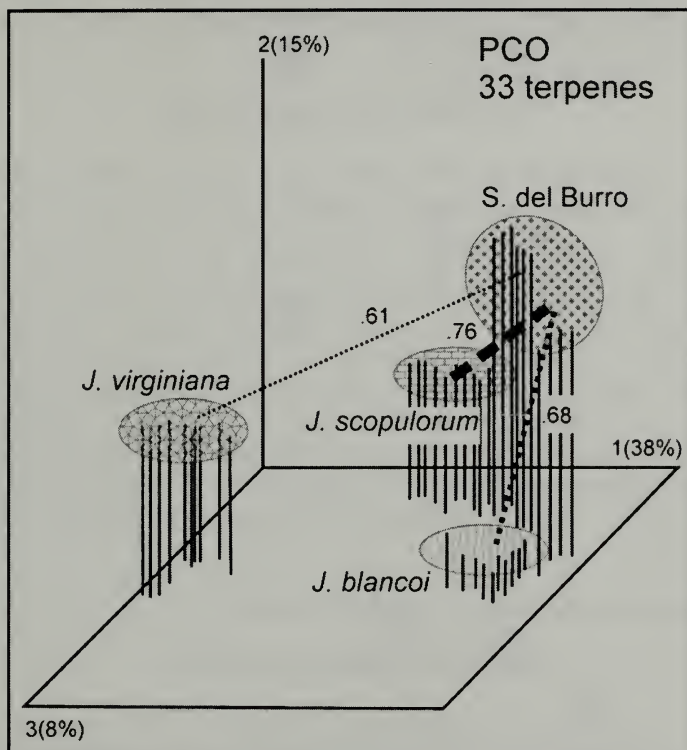


Figure 1. PCO based on leaf oil terpenes of *J. blancoi*, *J. scopulorum*, *J. virginiana*, and plants from Serranias del Burro (Coah., MX). The numbers next to the dashed lines are the similarities to the centroid of the clusters. Adapted from Adams (1983).

similar to *J. scopulorum* (Fig. 1). Adams (2008) treated the Serranias del Burro population as *J. scopulorum*. However, trees with two year old seed cones have not been found in the Serranias del Burro population, making identification as *J. scopulorum* problematical.

Juniperus scopulorum and *J. virginiana* are easy to differentiate based on SNPs from nrDNA (Adams, 2011). However, obtaining new specimens from the Serranias del Burro has been unsafe

due to the drug cartels operating in the area. The purpose of this paper is to report on the analyses of nrDNA from herbarium specimens from the Serranias del Burro.

MATERIALS AND METHODS

Specimens used in this study were: *J. blancoi*: Adams 6849-6851 & 6903-6904, 2580 m, 7 km s of Carmona (s of El Oro) Mexico, Mexico; *J. blancoi* var. *huehuentensis* Adams 10247-10251, 3227 m, Cerro Huehuento, Durango, Mexico; *J. blancoi* var. *mucronata*, Adams 8453-8463, 1180 m, 19 km w of Maicoba, Chihuahua/ Sonora border, Mexico; *J. scopulorum*, Adams 2010-2024, 2012 m, Durango, CO, USA; *J. virginiana*, Adams 6753-6755, Hewitt, TX, USA; *J. scopulorum/ blancoi*, Adams 2512, Colonia Pacheco, Mexico; *J. scopulorum/ virginiana*: Adams 2433, 20° 01' 30"N; 102° 07' 30"W. ca. 1550 m, Serranias del Burro, Mexico, 20 Feb 1977, Adams 12493, Serranias del Burro, Mexico (ex TEX specimen 00124832, D. Riskind and T. F. Paterson #1933, 10 Apr 1976), Voucher specimens are deposited at BAYLU, Baylor University.

DNA isolation and analyses - See Adams (2011).

RESULTS AND DISCUSSION

Sequencing nrDNA (1270bp) resulted in 13 SNPs (including indels) among the taxa. The samples from S. del Burro were separated from *J. virginiana* by 3 SNPs and from Colonia Pacheco (and n. Sonora) by 4 SNPs (Fig. 2). The S. del Burro plants are 8 SNPs removed from *J. scopulorum*, and 5 SNPs from *J. blancoi*. Recall that the leaf essential oils from S. del Burro were most like *J. scopulorum* then to *J. blancoi* (Fig. 1).

Plotting the minimum spanning network onto distribution maps (Fig. 3) gives a geographic perspective. Notice the proximity of S. del Burro to *J. virginiana*. The linkage of S. del Burro to *J. virginiana* (3 SNPs) is nearly the same as to Colonia Pacheco (4 SNPs).

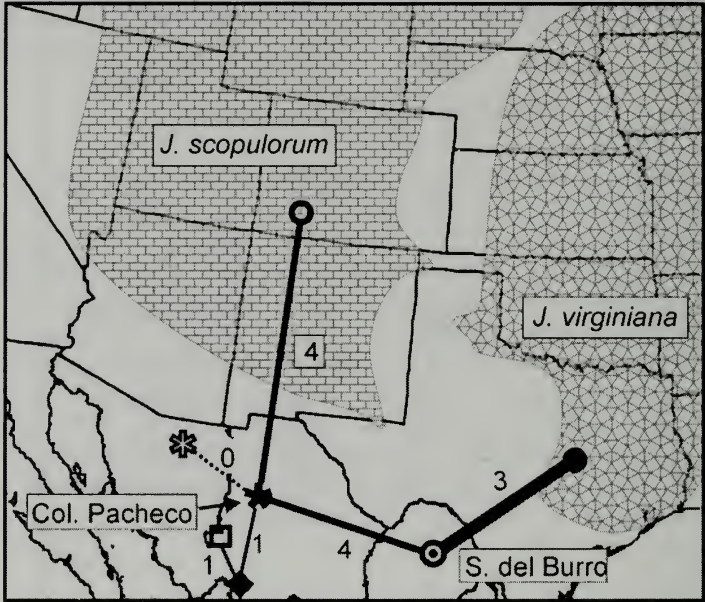


Figure 3. Minimum spanning network. Numbers next to the lines are SNPs. Symbols are defined in figure 2.

CONCLUSIONS

It seems likely that during the Pleistocene ice ages, both *J. scopulorum* and *J. virginiana* repeatedly invaded northern Mexico as vegetation zones descended during cooler, more mesic periods. It is not surprising that Colonia Pacheco, northern Sonora and Serranias del Burro populations contain mixtures of genes of these species.

ACKNOWLEDGEMENTS

This research was supported in part with funds from Baylor University. Thanks to Tonya Yanke for lab assistance. Thanks to Tom Zanoni for the use of his *J. blancoi* oils from El Salto, Mexico and assistance on trips to Colonia Pacheco and El Oro and many other such trips. David Riskind arranged the field trip to the Serranias del Burro

in 1977. A special thanks to Socorro Gonzales Elizondo for sharing both field data and specimens of *J. b.* var. *huehuentensis* from Cerro Mohinora and other data.

LITERATURE CITED

- Adams, R. P. 1983. Intraspecific terpenoid variation in *Juniperus scopulorum*: evidence for Pleistocene refugia and recolonization in western North America. *Taxon* 32: 30-46.
- Adams, R. P. 2008. The junipers of the world: The genus *Juniperus*. 2nd. ed. Trafford Publ., Victoria, BC.
- Adams, R. P. 2011. Intraspecific terpenoid variation in *Juniperus scopulorum*: Pleistocene refugia and Post-Pleistocene recolonization. *Phytologia* 93: 3-12.